OIPE JC163
MAR 29 2004
PATENT & TRADEMARK OFFICE

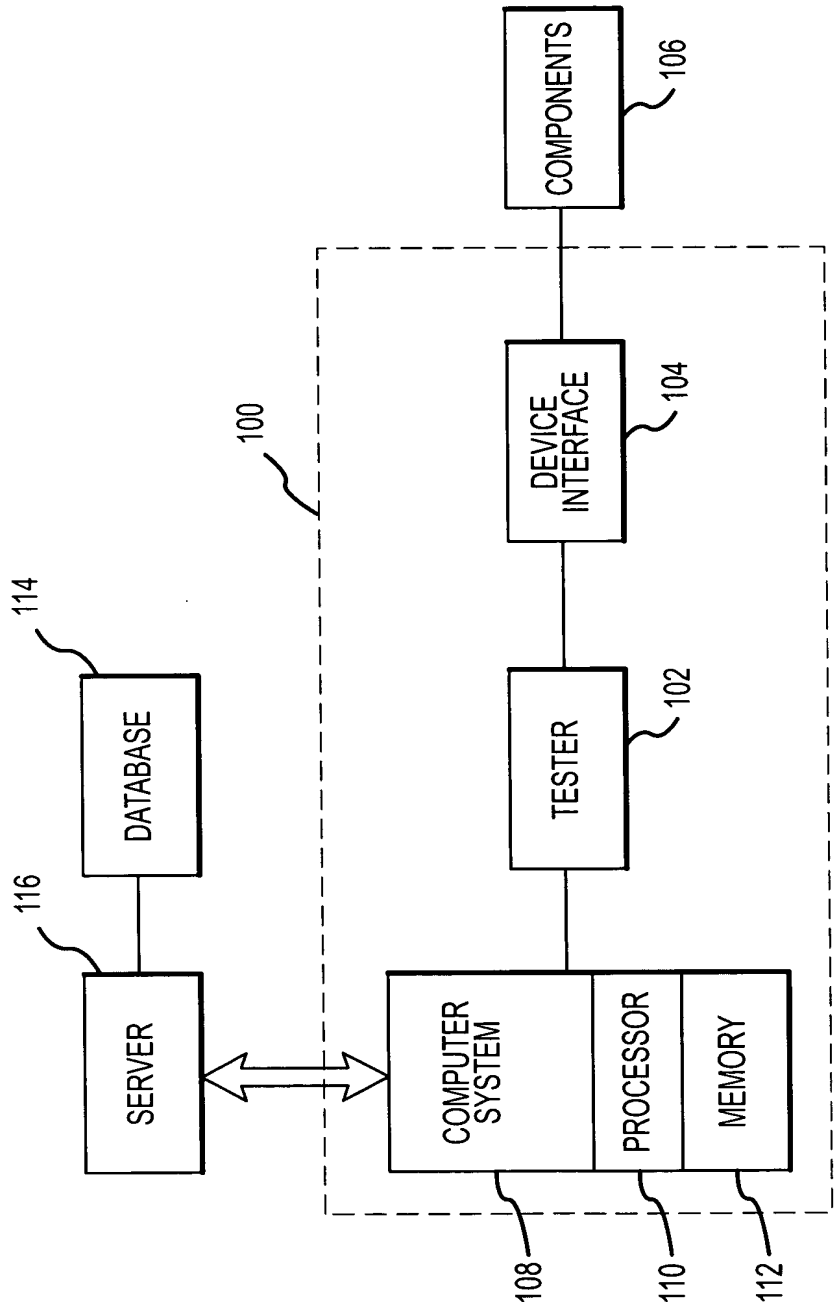

FIG.1

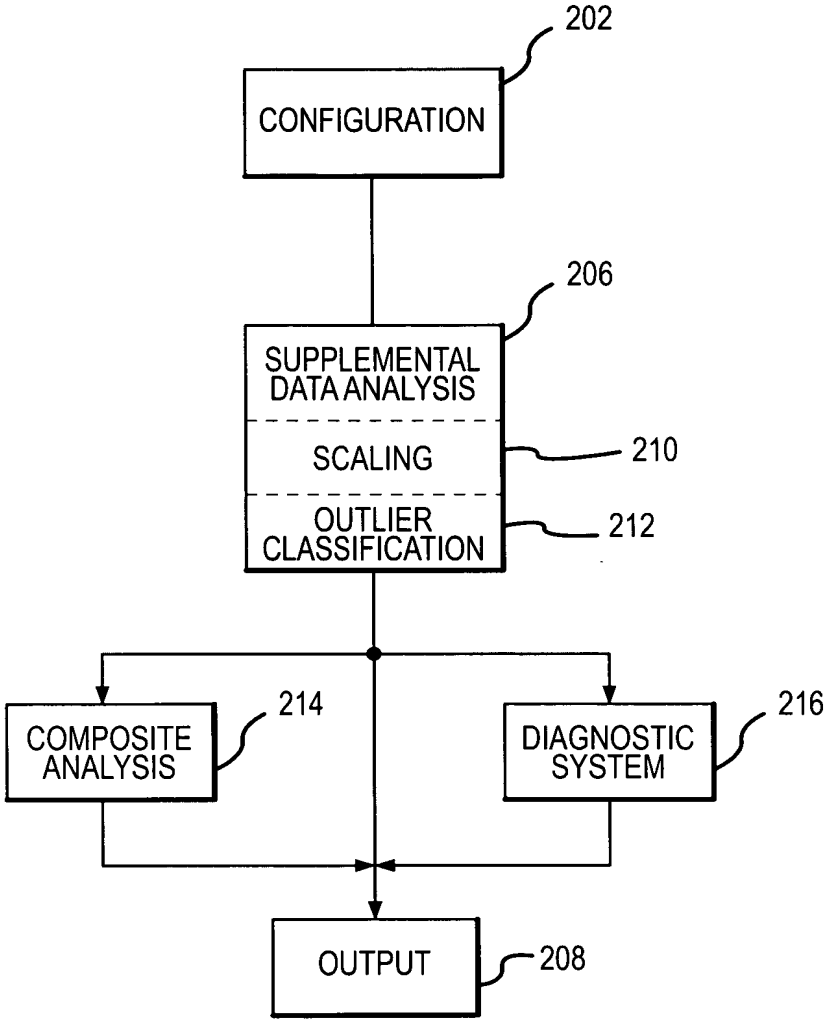
202
CONFIGURATION
206
SUPPLEMENTAL DATA ANALYSIS
SCALING
210
OUTLIER CLASSIFICATION
212
COMPOSITE ANALYSIS
214
DIAGNOSTIC SYSTEM
216
OUTPUT
208

FIG.2

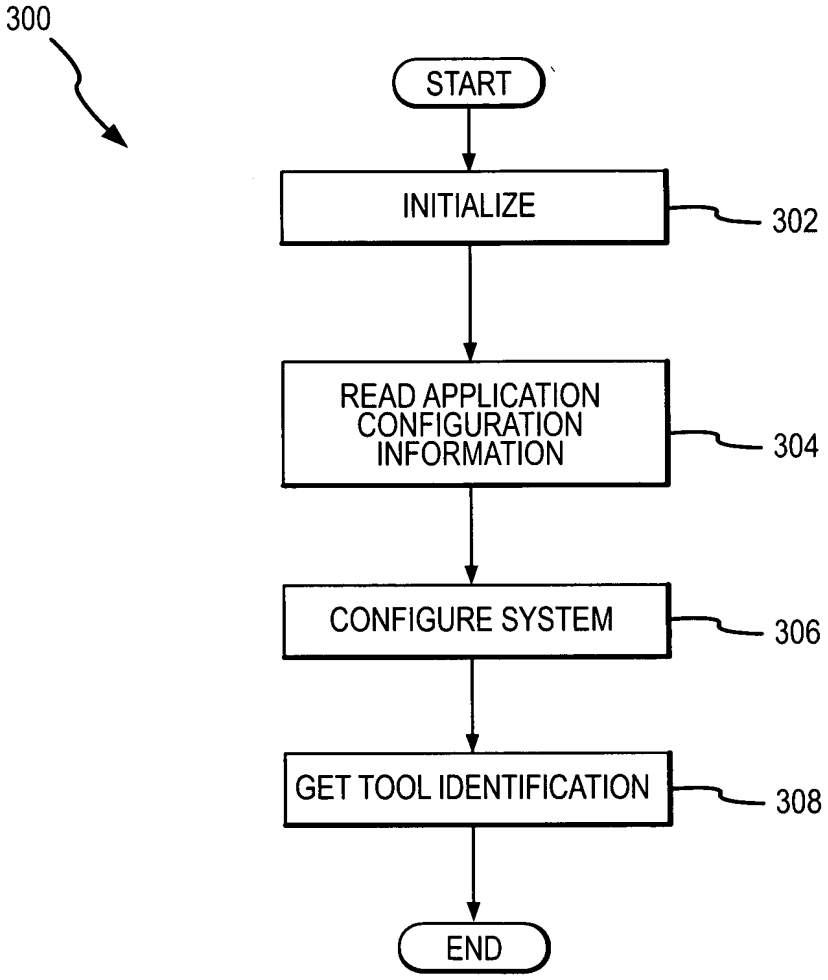
300
START
INITIALIZE
302
READ APPLICATION CONFIGURATION INFORMATION
304
CONFIGURE SYSTEM
306
GET TOOL IDENTIFICATION
308
END

FIG.3

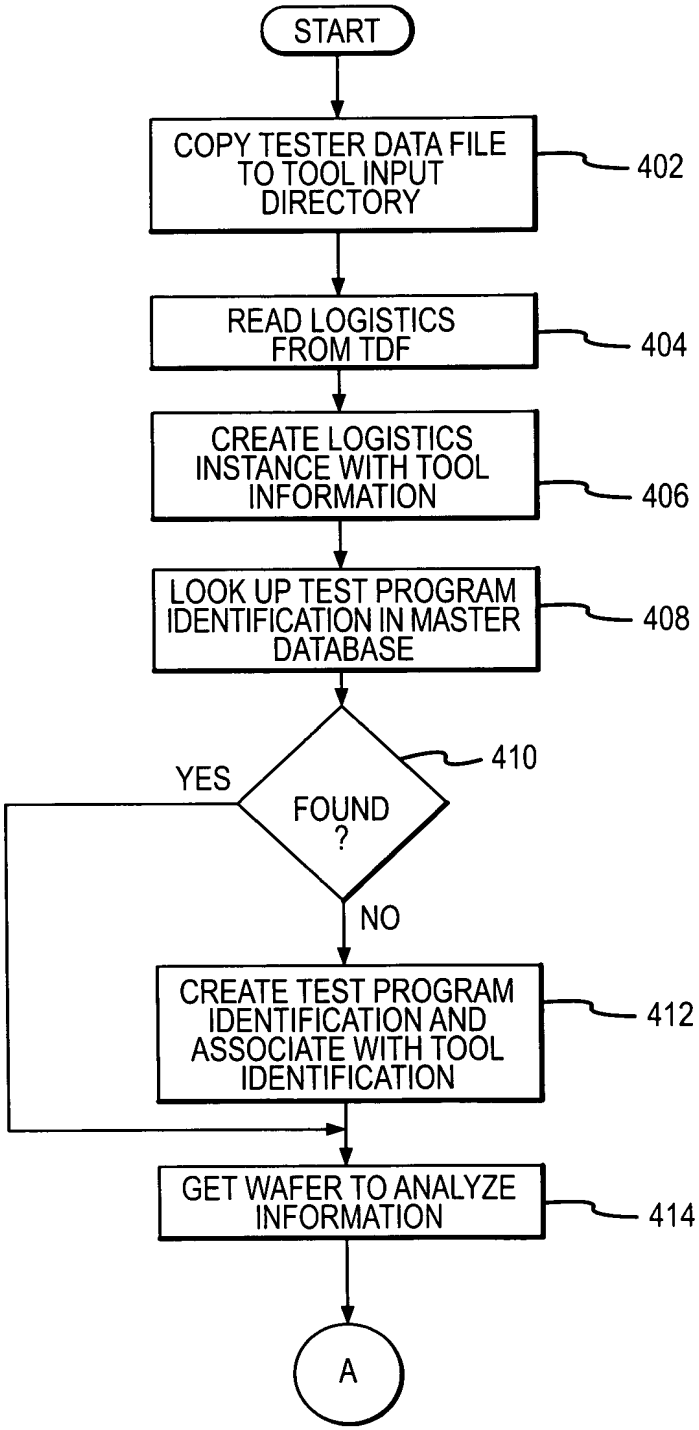
START
COPY TESTER DATA FILE TO TOOL INPUT DIRECTORY
402
READ LOGISTICS FROM TDF
404
CREATE LOGISTICS INSTANCE WITH TOOL INFORMATION
406
LOOK UP TEST PROGRAM IDENTIFICATION IN MASTER DATABASE
408
FOUND ?
410
YES
NO
CREATE TEST PROGRAM IDENTIFICATION AND ASSOCIATE WITH TOOL IDENTIFICATION
412
GET WAFER TO ANALYZE INFORMATION
414
A

FIG.4A

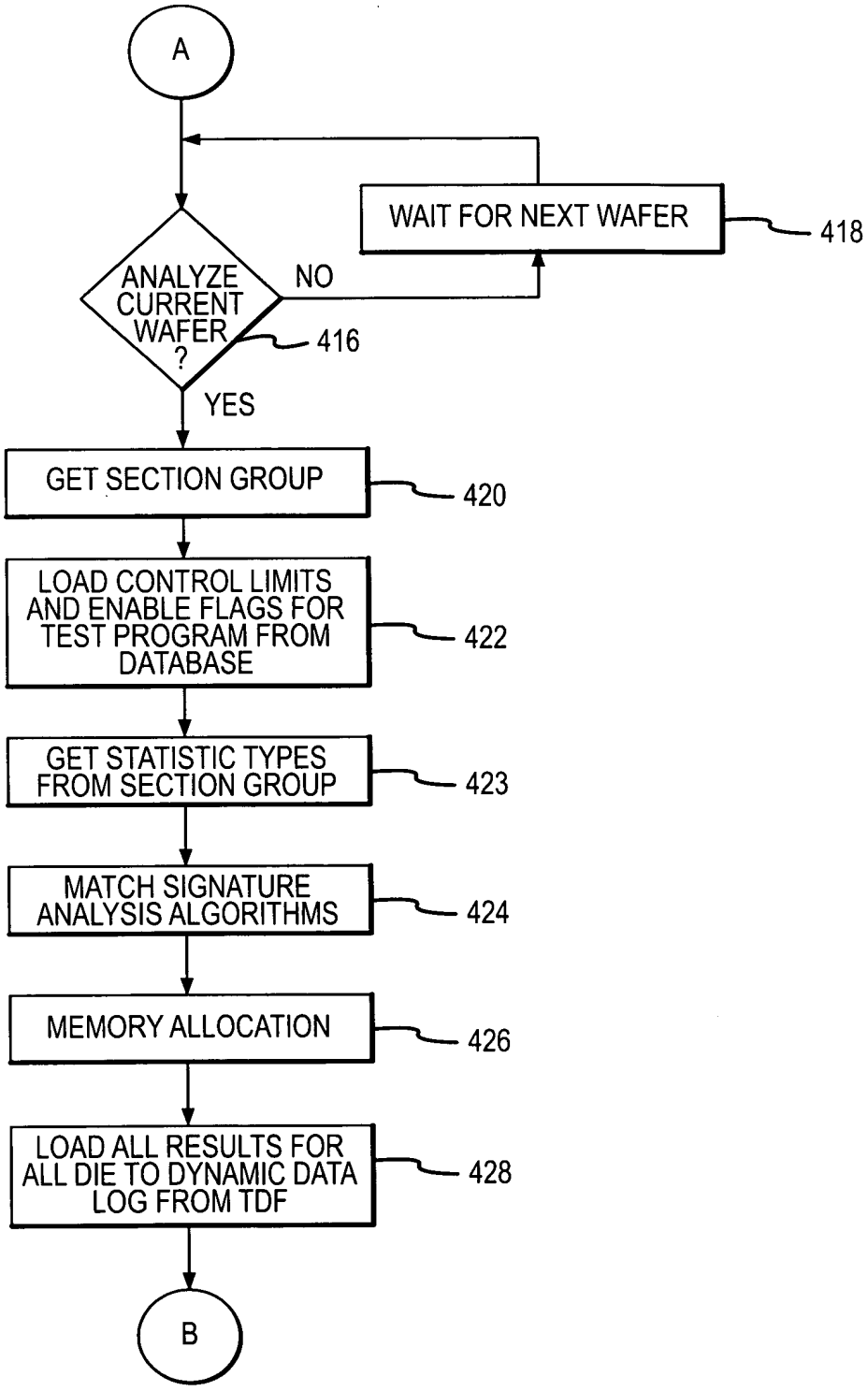
A
WAIT FOR NEXT WAFER
418
ANALYZE CURRENT WAFER ?
NO
416
YES
GET SECTION GROUP
420
LOAD CONTROL LIMITS AND ENABLE FLAGS FOR TEST PROGRAM FROM DATABASE
422
GET STATISTIC TYPES FROM SECTION GROUP
423
MATCH SIGNATURE ANALYSIS ALGORITHMS
424
MEMORY ALLOCATION
426
LOAD ALL RESULTS FOR ALL DIE TO DYNAMIC DATA LOG FROM TDF
428
B

FIG.4B

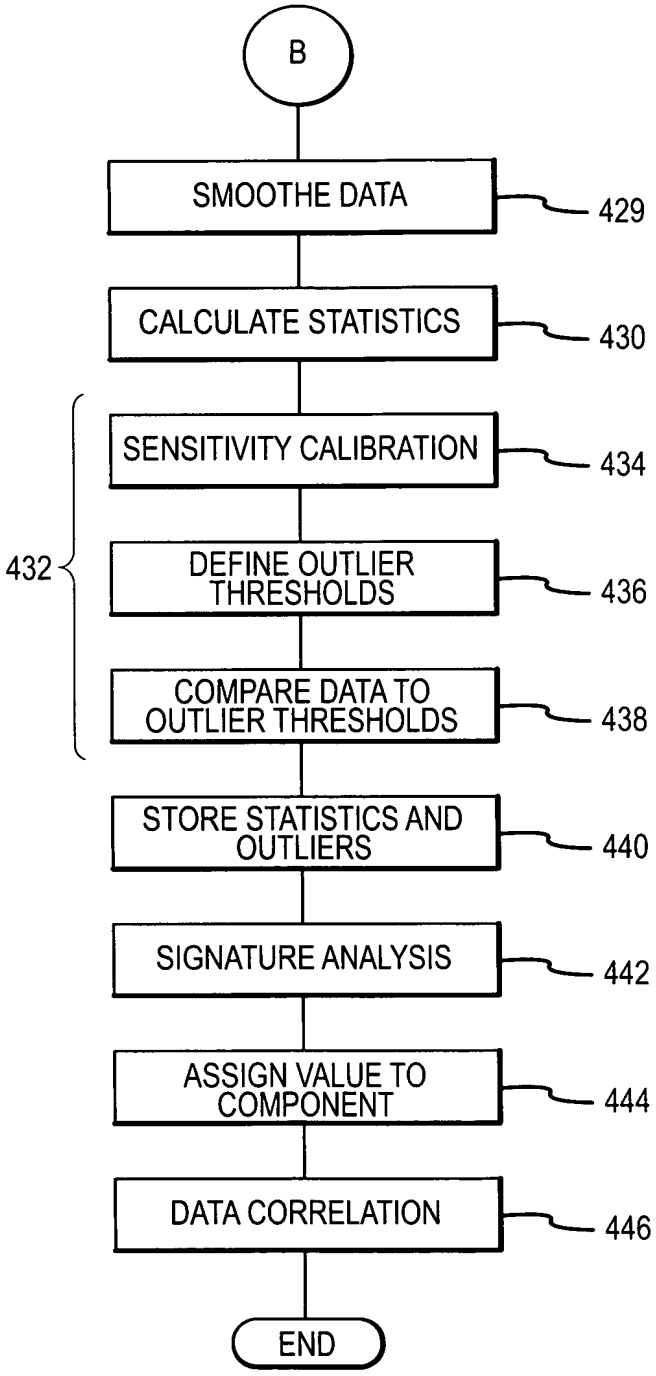
B
SMOOTHE DATA
429
CALCULATE STATISTICS
430
SENSITIVITY CALIBRATION
434
432
DEFINE OUTLIER THRESHOLDS
436
COMPARE DATA TO OUTLIER THRESHOLDS
438
STORE STATISTICS AND OUTLIERS
440
SIGNATURE ANALYSIS
442
ASSIGN VALUE TO COMPONENT
444
DATA CORRELATION
446
END

FIG.4C

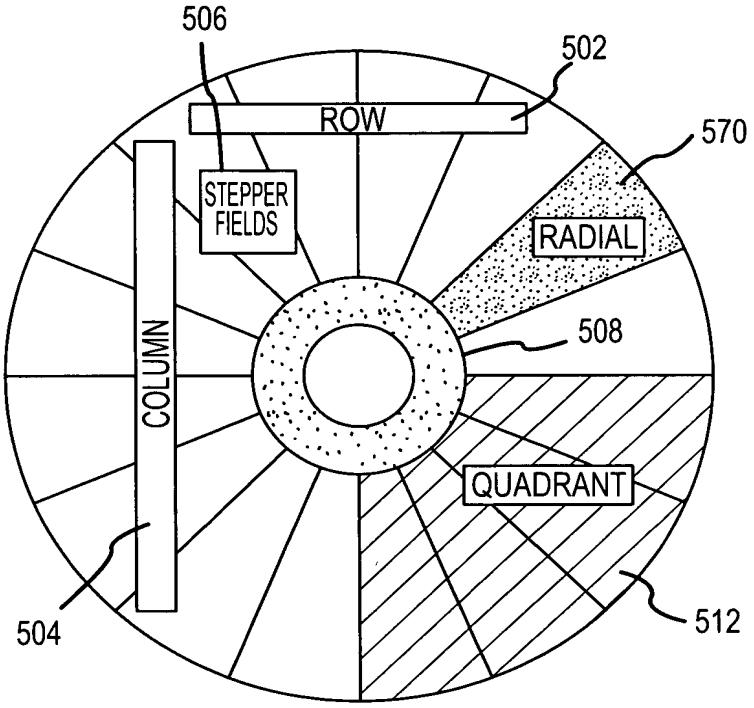
506
502
570
ROW
STEPPER FIELDS
RADIAL
508
COLUMN
QUADRANT
504
512

FIG.5

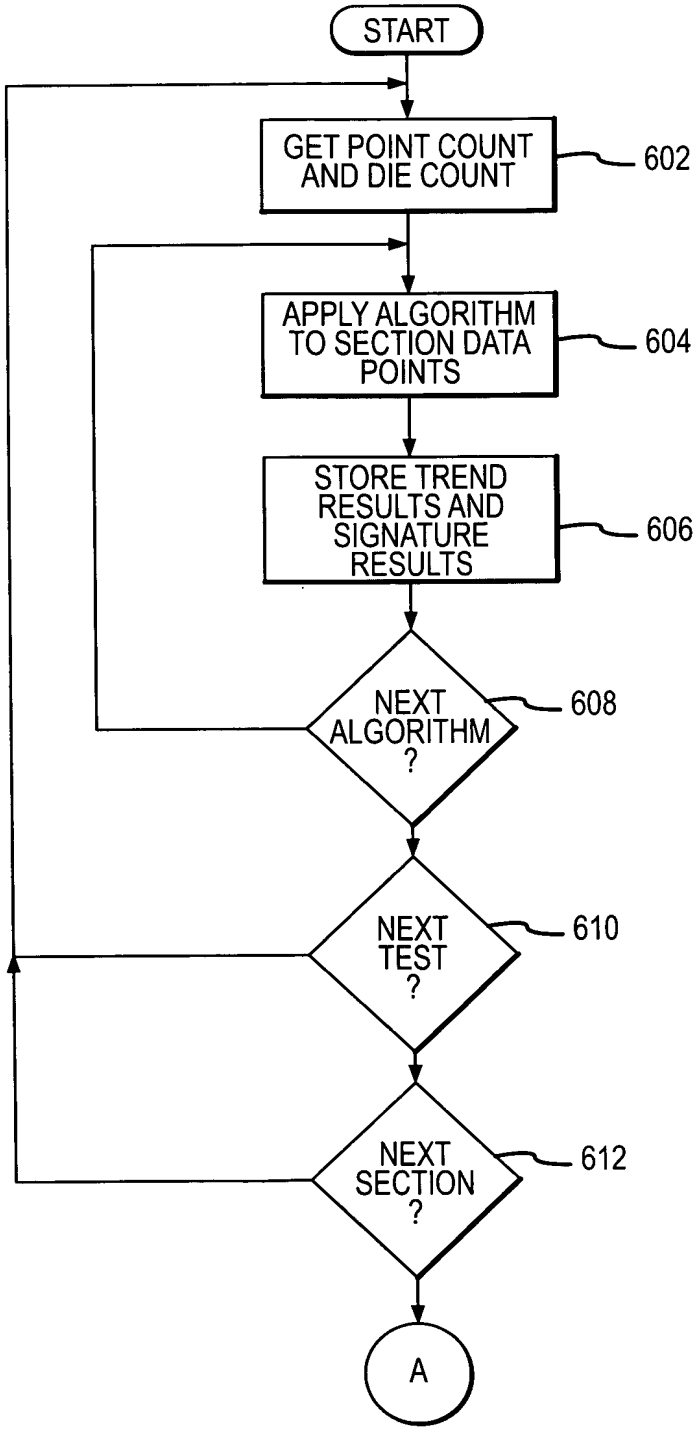
START
GET POINT COUNT AND DIE COUNT
602
APPLY ALGORITHM TO SECTION DATA POINTS
604
STORE TREND RESULTS AND SIGNATURE RESULTS
606
NEXT ALGORITHM ?
608
NEXT TEST ?
610
NEXT SECTION ?
612
A

FIG.6A

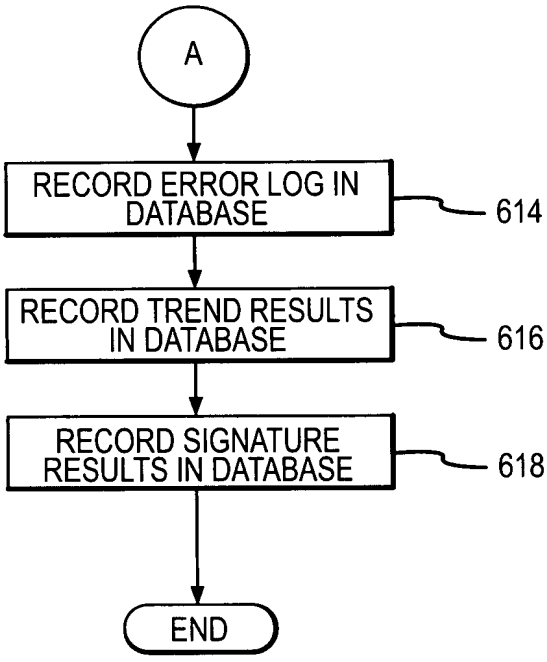
A
RECORD ERROR LOG IN DATABASE
614
RECORD TREND RESULTS IN DATABASE
616
RECORD SIGNATURE RESULTS IN DATABASE
618
END

FIG.6B

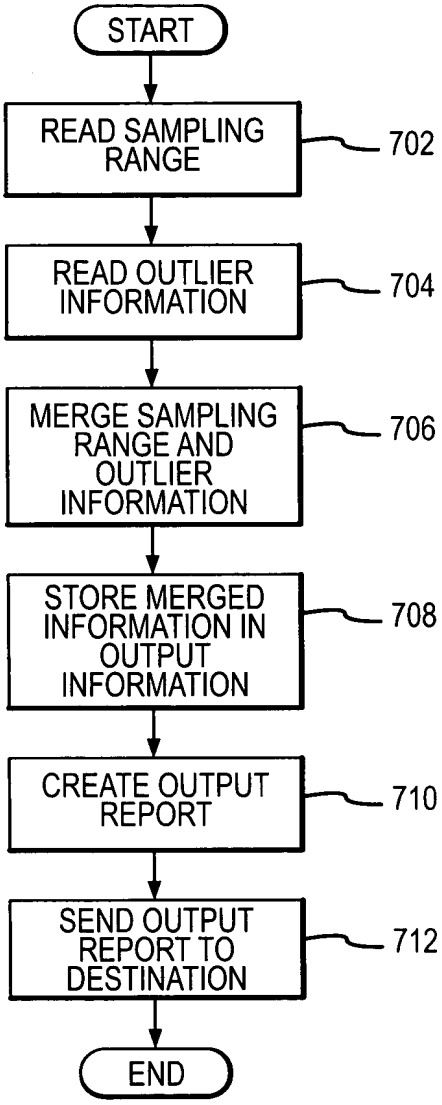
START
READ SAMPLING RANGE
702
READ OUTLIER INFORMATION
704
MERGE SAMPLING RANGE AND OUTLIER INFORMATION
706
STORE MERGED INFORMATION IN OUTPUT INFORMATION
708
CREATE OUTPUT REPORT
710
SEND OUTPUT REPORT TO DESTINATION
712
END

FIG.7

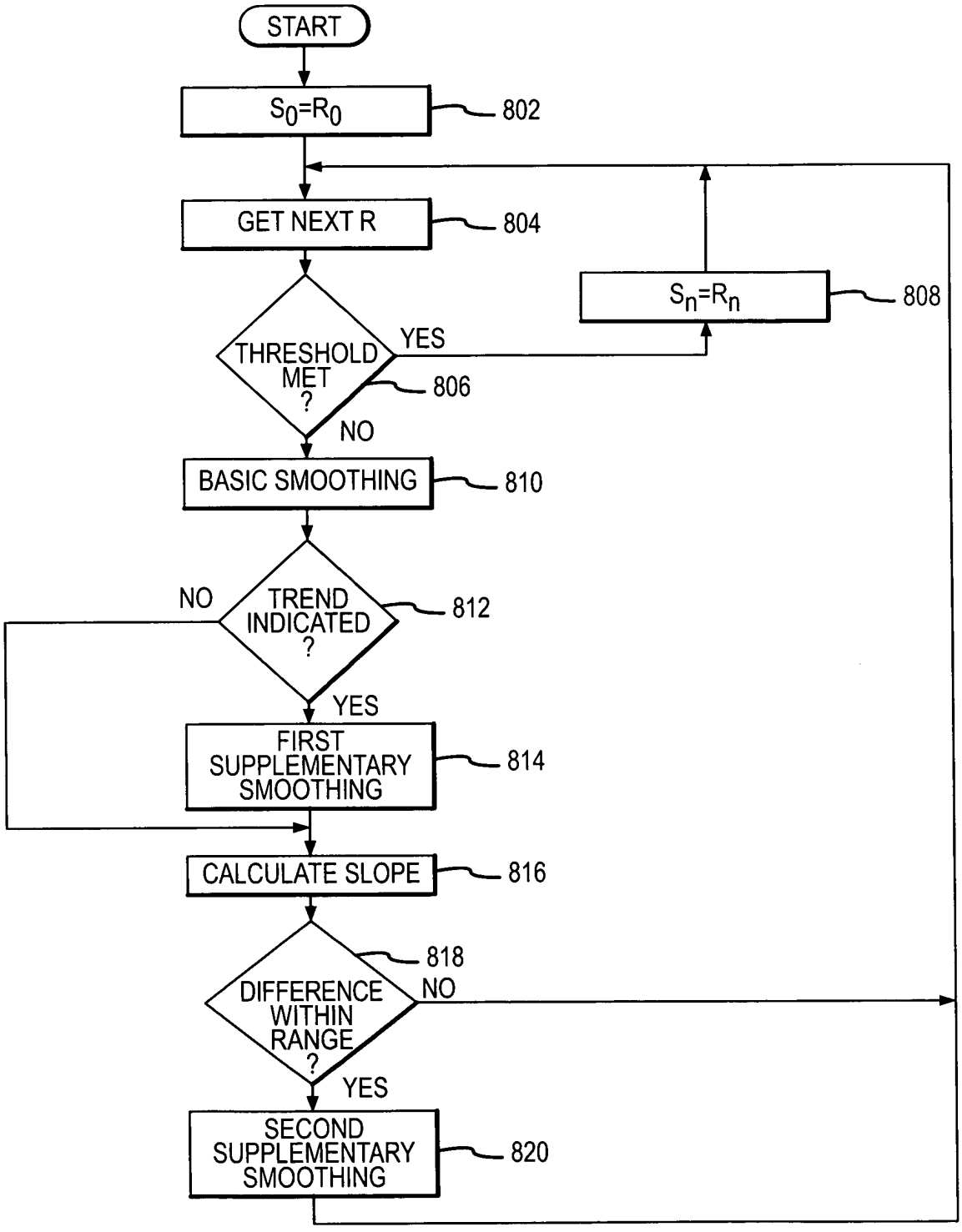
START
$S_0=R_0$
802
GET NEXT R
804
$S_n=R_n$
808
THRESHOLD MET ?
806
YES
NO
BASIC SMOOTHING
810
TREND INDICATED ?
812
NO
YES
FIRST SUPPLEMENTARY SMOOTHING
814
CALCULATE SLOPE
816
DIFFERENCE WITHIN RANGE ?
818
NO
YES
SECOND SUPPLEMENTARY SMOOTHING
820

FIG.8

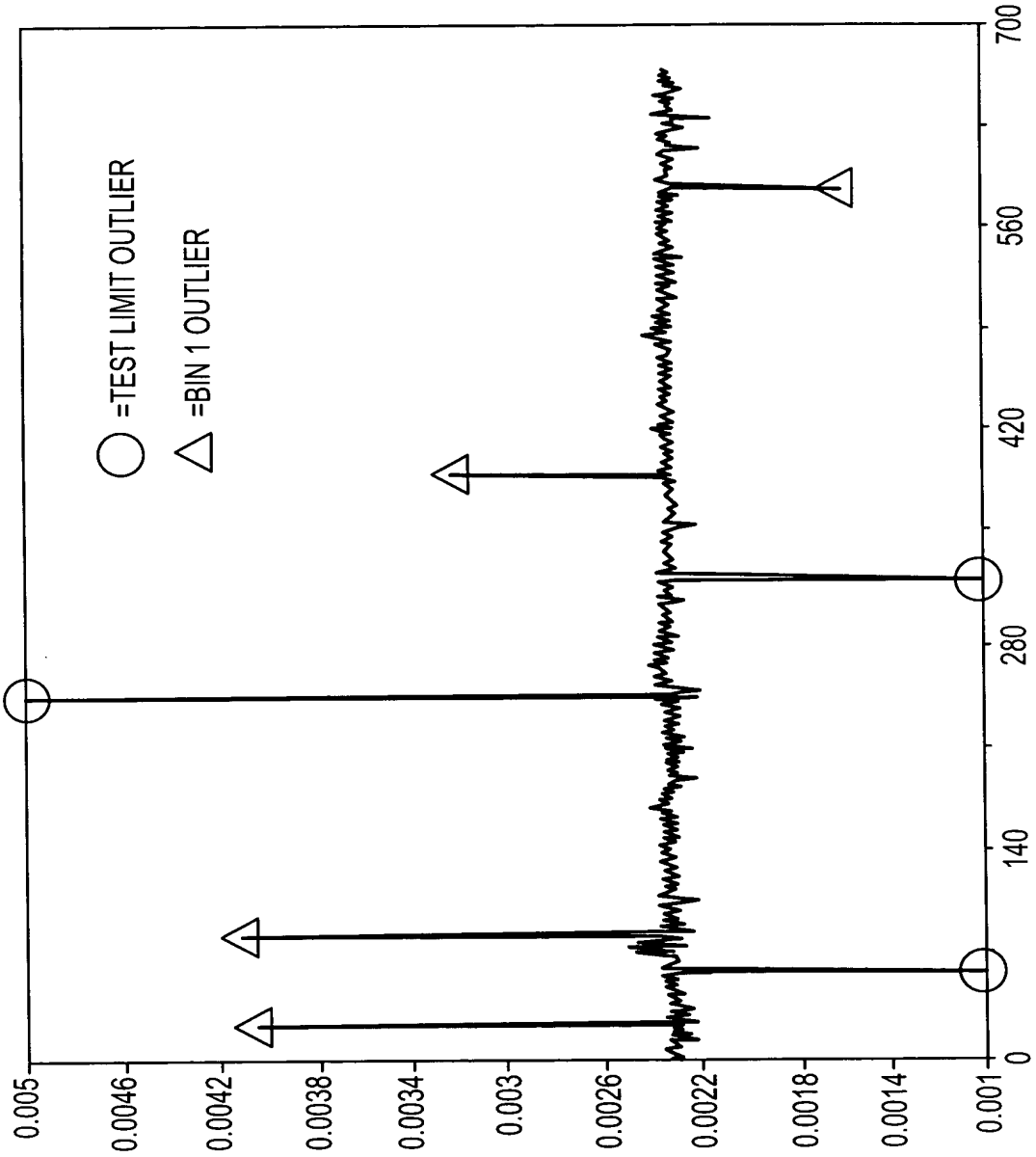
=TEST LIMIT OUTLIER
=BIN 1 OUTLIER
0.005
0.0046
0.0042
0.0038
0.0034
0.003
0.0026
0.0022
0.0018
0.0014
0.001
0
140
280
420
560
700
( ) DATA

FIG.9

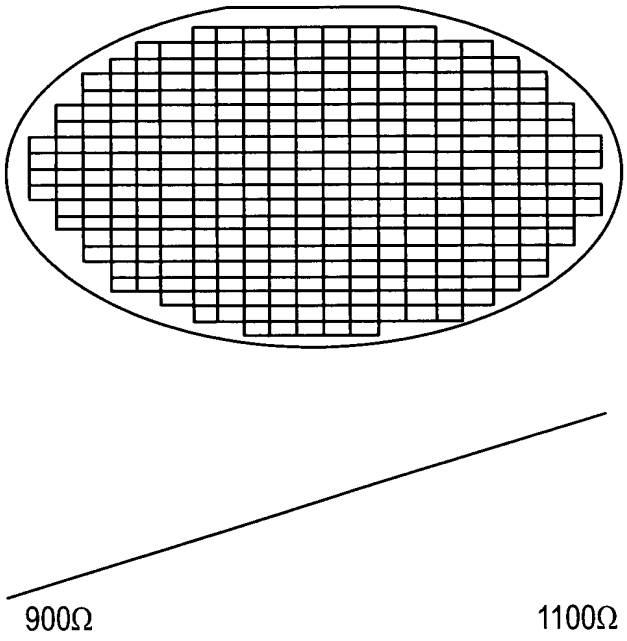

FIG.10

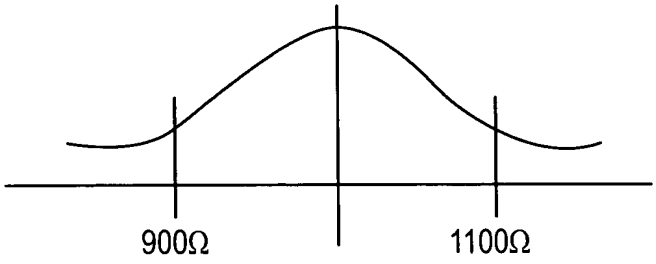

FIG.11

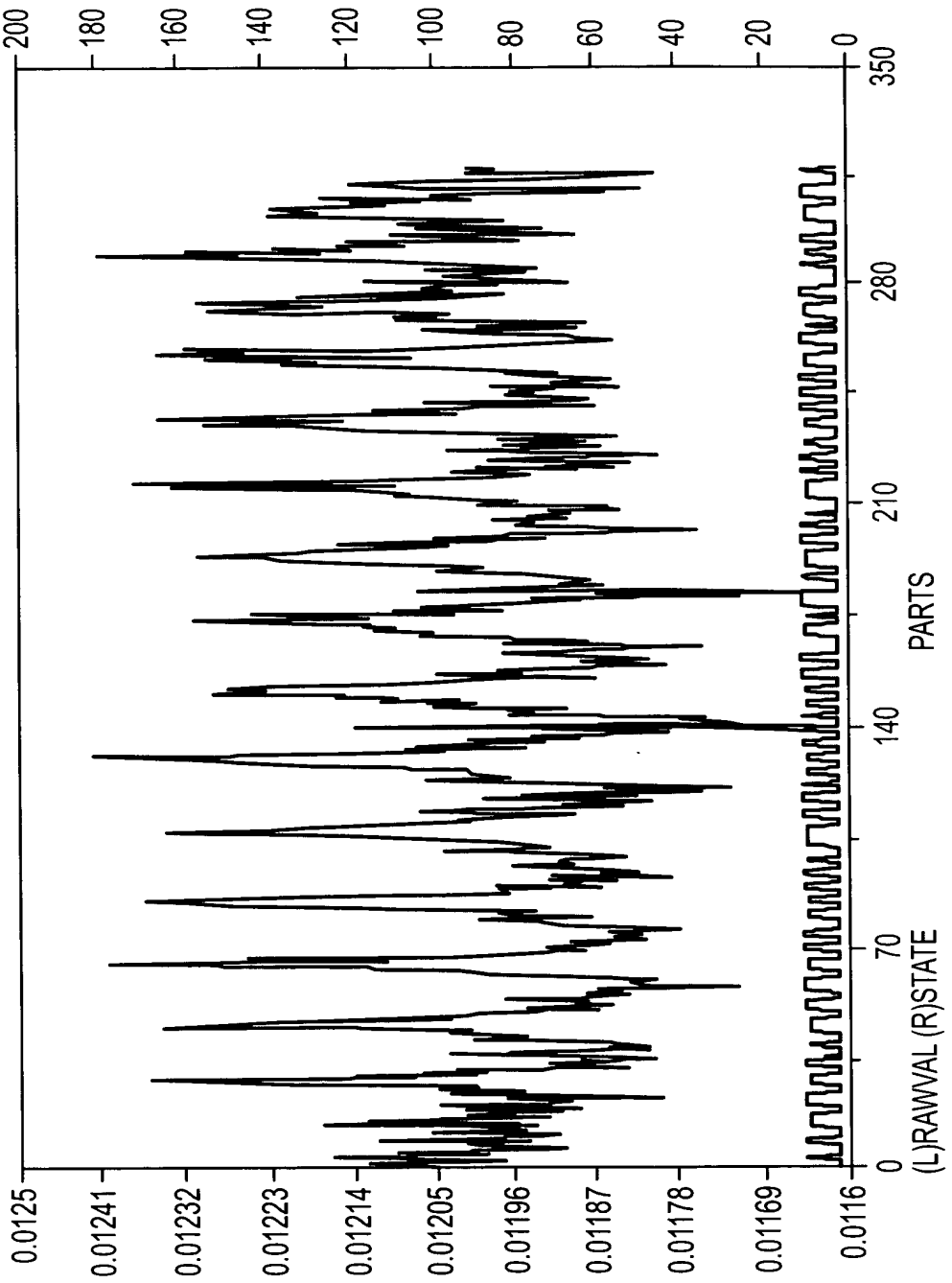
200
180
160
140
120
100
80
60
40
20
0
350
280
210
140
70
0
PARTS
(L)RAWVAL (R)STATE
0.0125
0.01241
0.01232
0.01223
0.01214
0.01205
0.01196
0.01187
0.01178
0.01169
0.0116

FIG.12A

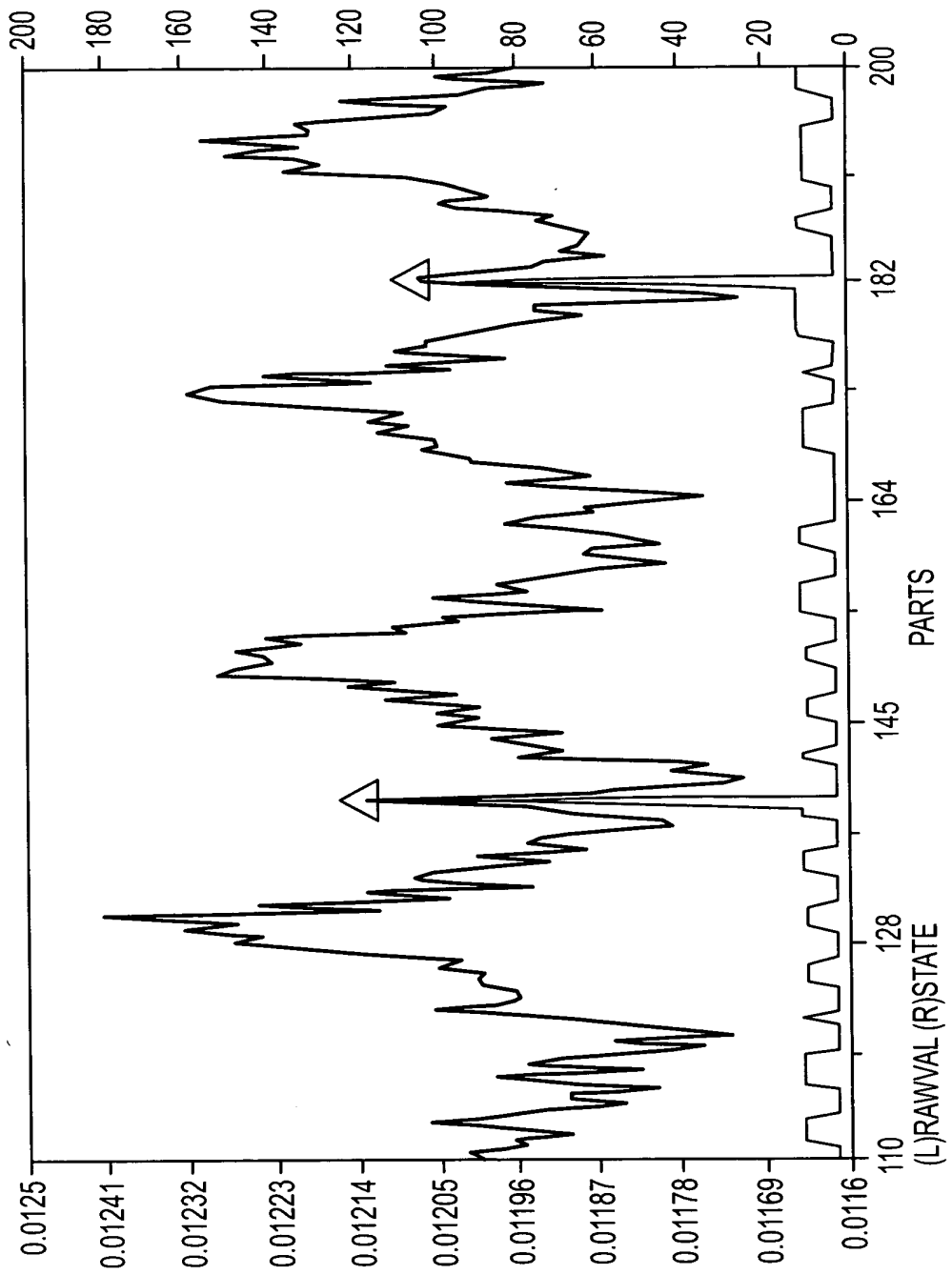
200
180
160
140
120
100
80
60
40
20
0
0.0125
0.01241
0.01232
0.01223
0.01214
0.01205
0.01196
0.01187
0.01178
0.01169
0.0116
110
128
145
164
182
200
PARTS
(L)RAWVAL (R)STATE

FIG.12B

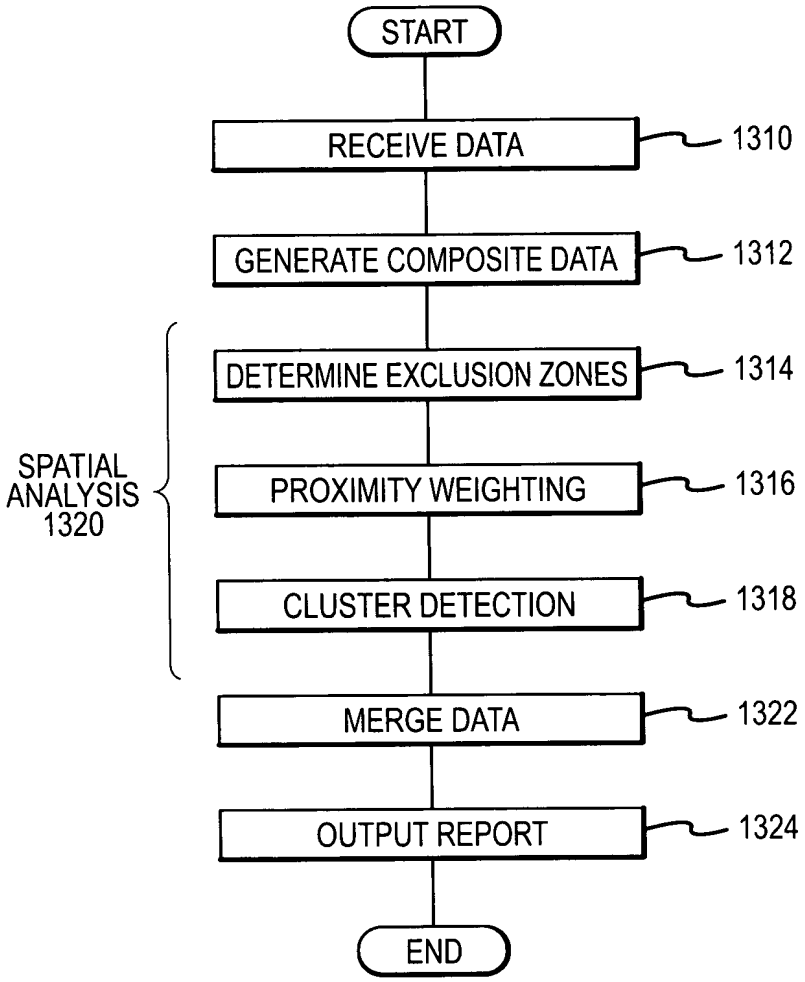
START
RECEIVE DATA
1310
GENERATE COMPOSITE DATA
1312
DETERMINE EXCLUSION ZONES
1314
SPATIAL ANALYSIS 1320
PROXIMITY WEIGHTING
1316
CLUSTER DETECTION
1318
MERGE DATA
1322
OUTPUT REPORT
1324
END

FIG.13

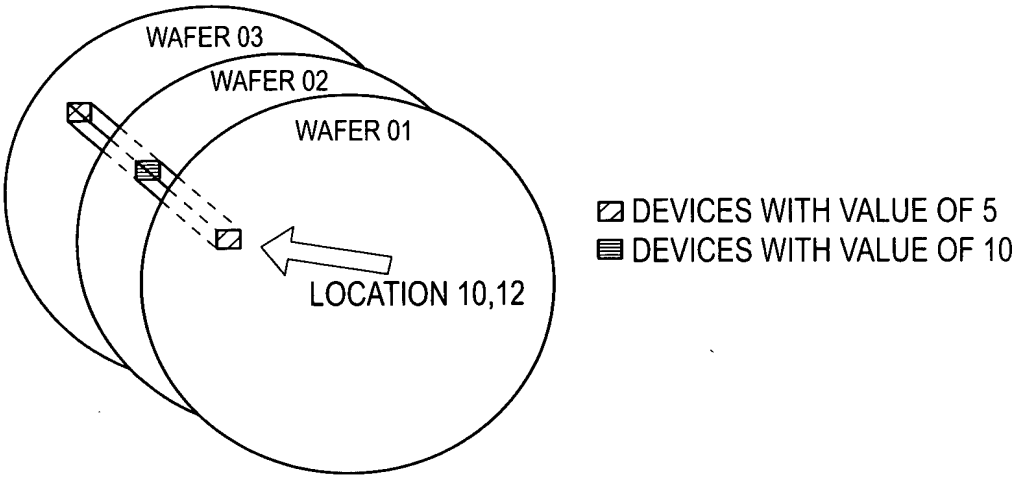

FIG.14

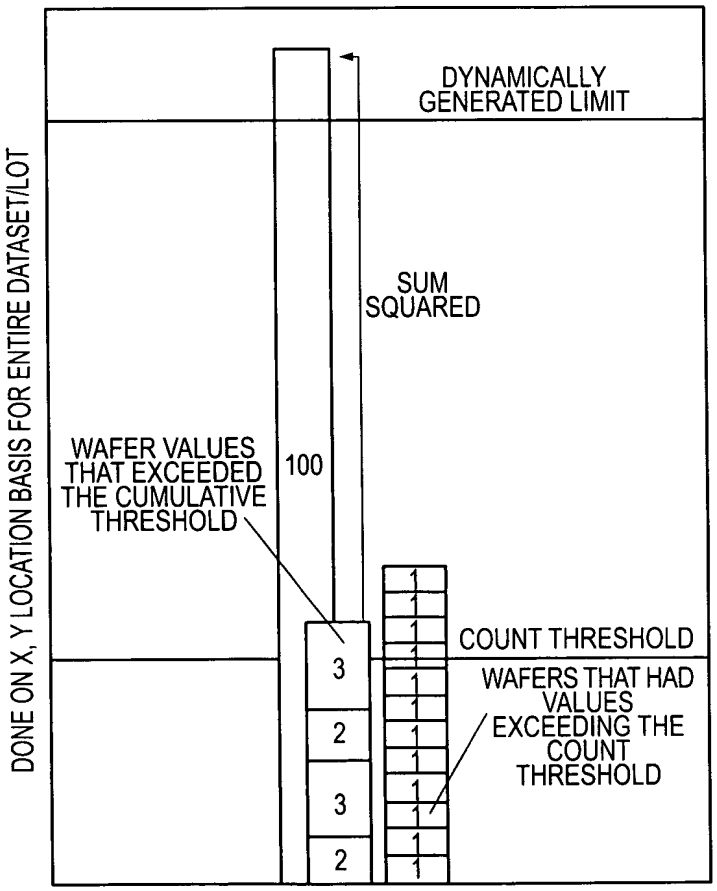

FIG.15C

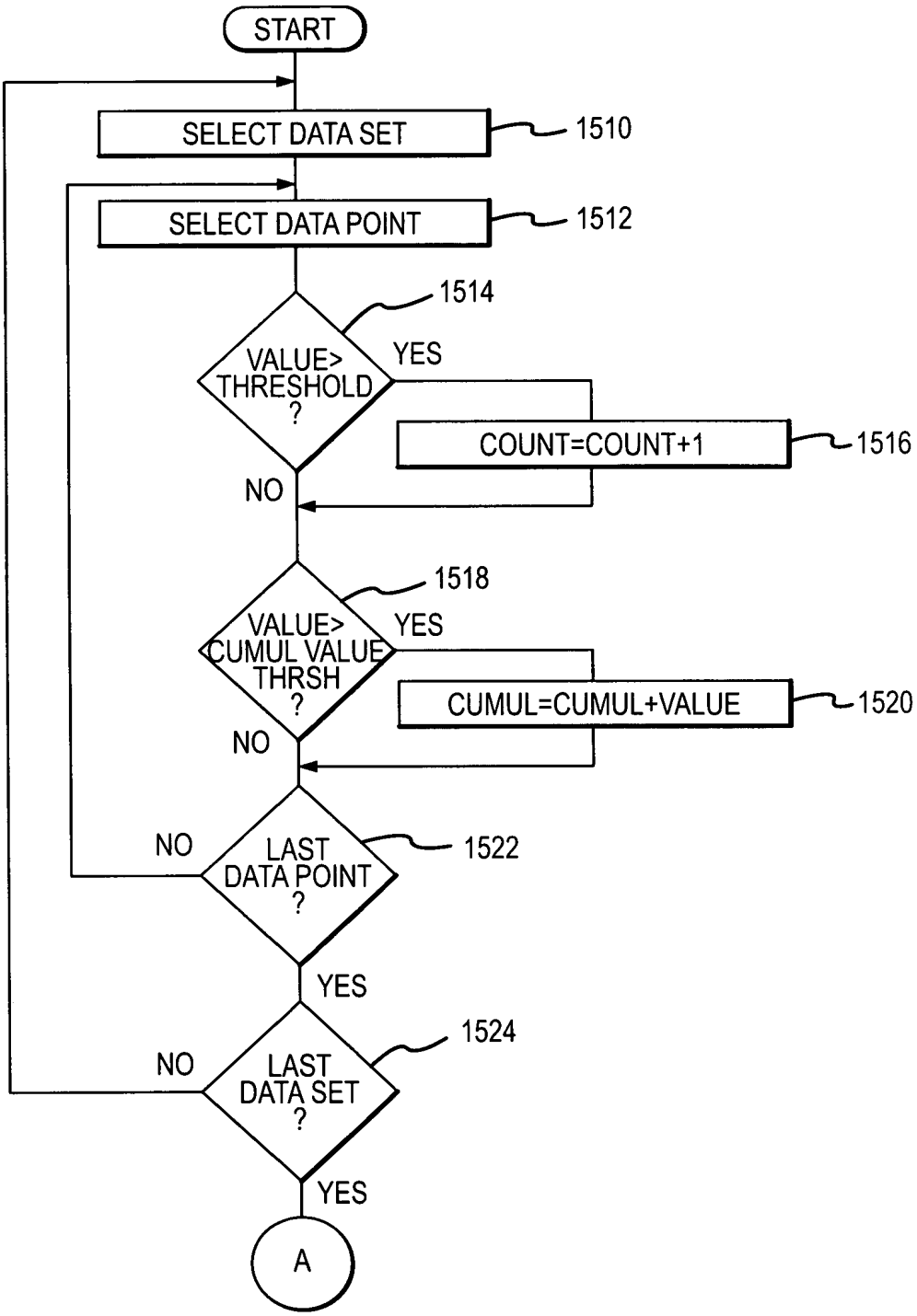
START
SELECT DATA SET
1510
SELECT DATA POINT
1512
1514
VALUE> THRESHOLD ?
YES
COUNT=COUNT+1
1516
NO
1518
VALUE> CUMUL VALUE THRSH ?
YES
CUMUL=CUMUL+VALUE
1520
NO
NO
LAST DATA POINT ?
1522
YES
1524
NO
LAST DATA SET ?
YES
A

FIG.15A

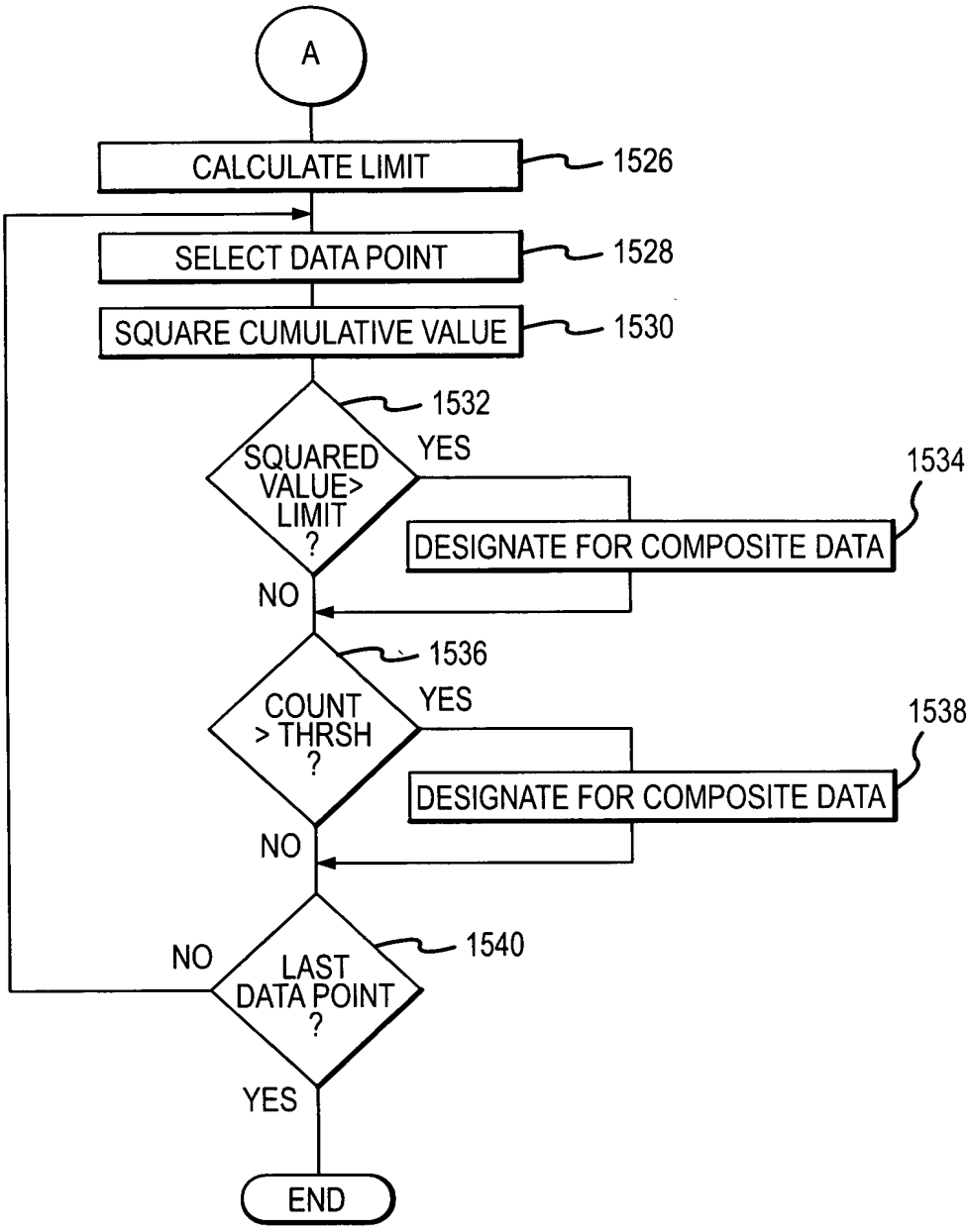
A
CALCULATE LIMIT
1526
SELECT DATA POINT
1528
SQUARE CUMULATIVE VALUE
1530
1532
SQUARED VALUE> LIMIT ?
YES
1534
DESIGNATE FOR COMPOSITE DATA
NO
1536
COUNT > THRSH ?
YES
1538
DESIGNATE FOR COMPOSITE DATA
NO
1540
NO
LAST DATA POINT ?
YES
END

FIG.15B

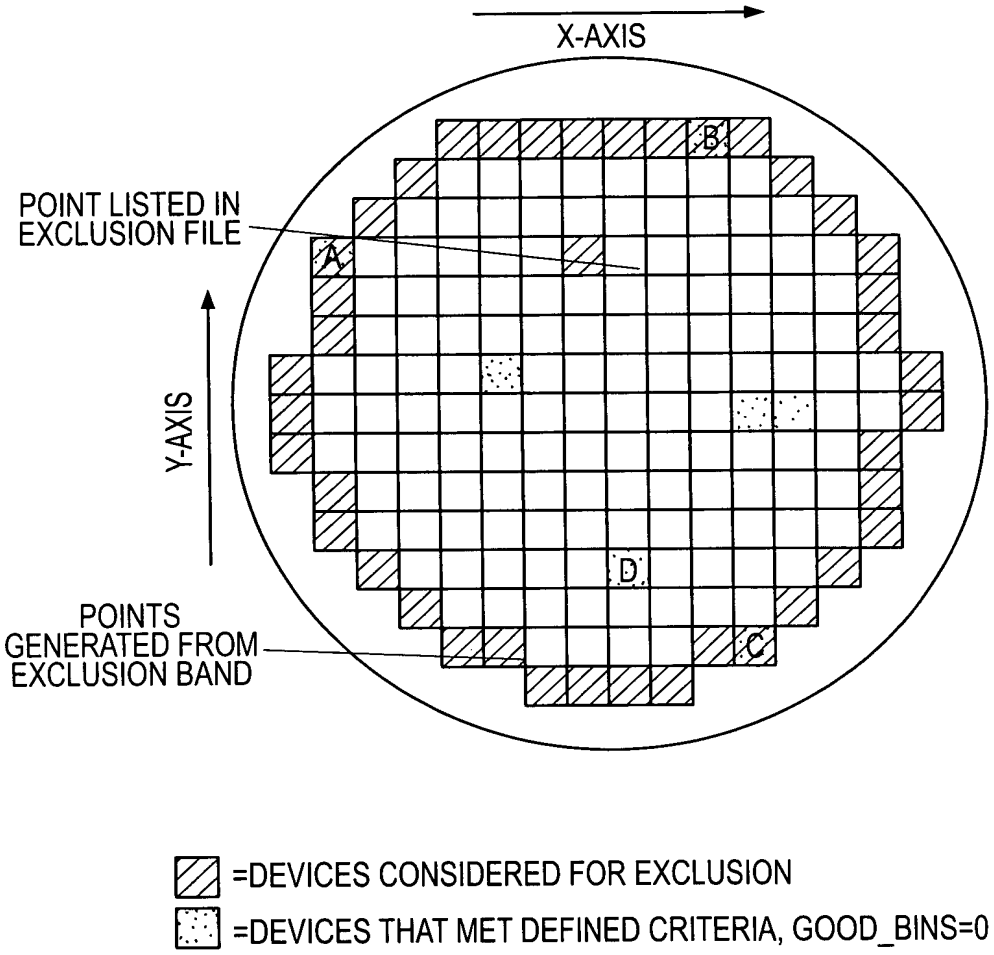
X-AXIS
Y-AXIS
POINT LISTED IN EXCLUSION FILE
POINTS GENERATED FROM EXCLUSION BAND
A
B
C
D
=DEVICES CONSIDERED FOR EXCLUSION
=DEVICES THAT MET DEFINED CRITERIA, GOOD_BINS=0

FIG.16

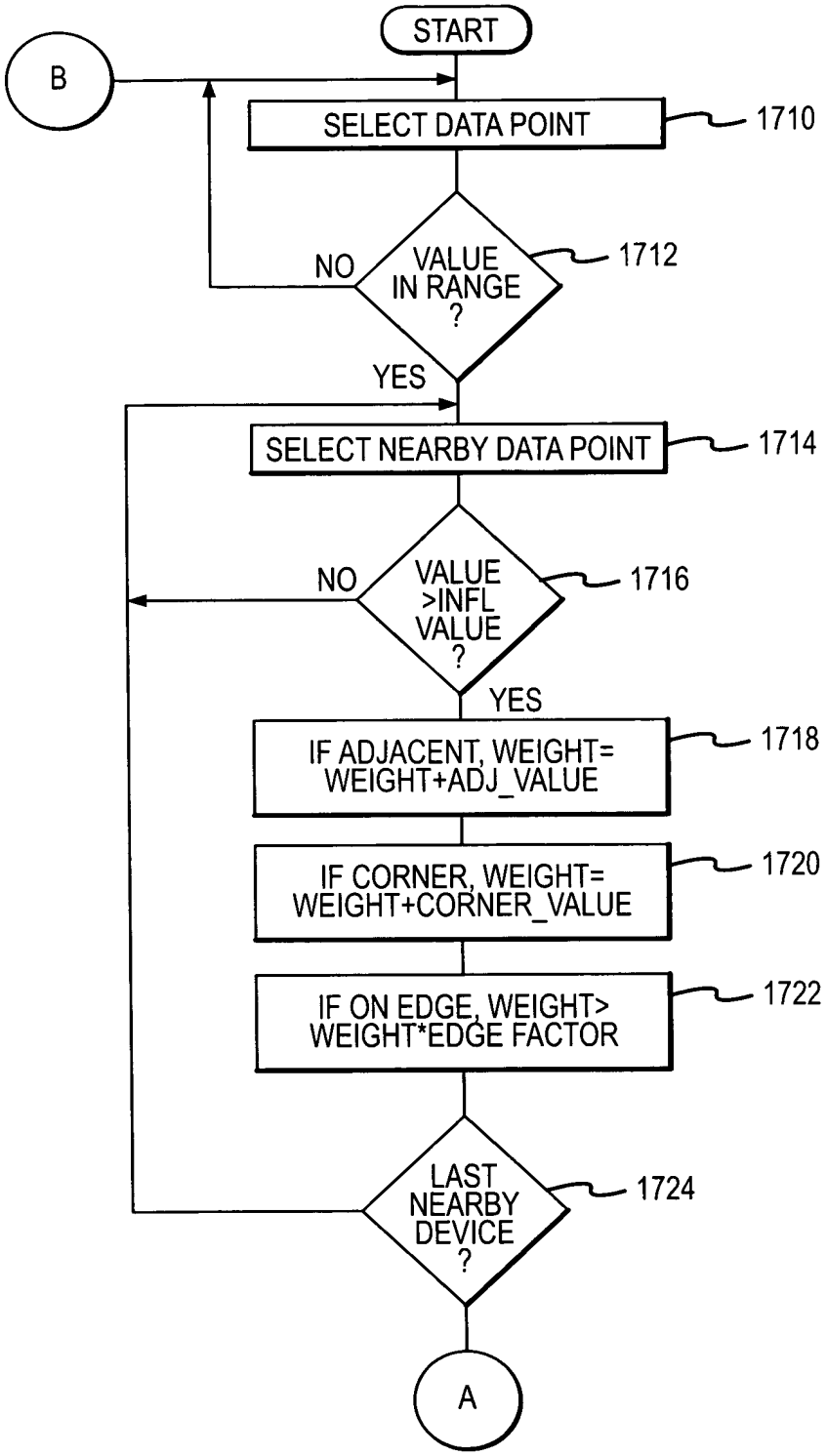
START
B
SELECT DATA POINT
1710
NO
VALUE IN RANGE ?
1712
YES
SELECT NEARBY DATA POINT
1714
NO
VALUE >INFL VALUE ?
1716
YES
IF ADJACENT, WEIGHT= WEIGHT+ADJ_VALUE
1718
IF CORNER, WEIGHT= WEIGHT+CORNER_VALUE
1720
IF ON EDGE, WEIGHT> WEIGHT*EDGE FACTOR
1722
LAST NEARBY DEVICE ?
1724
A

FIG.17A

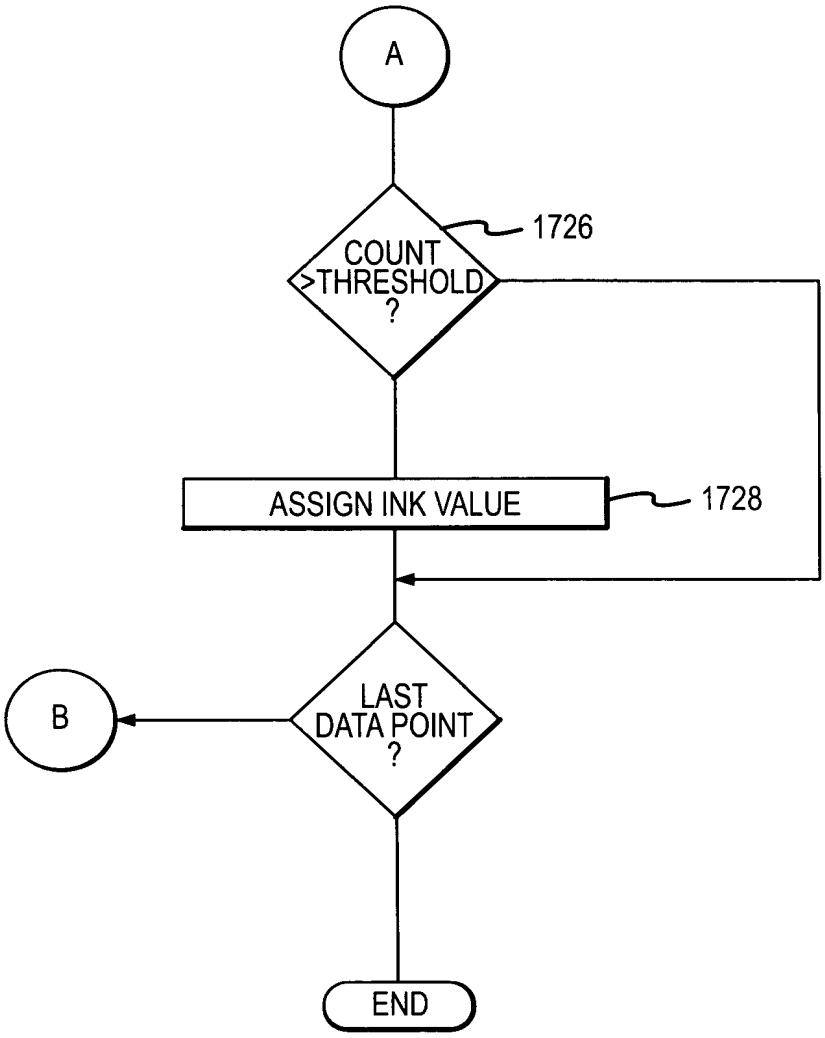
A
COUNT >THRESHOLD ?
1726
ASSIGN INK VALUE
1728
LAST DATA POINT ?
B
END

FIG.17B

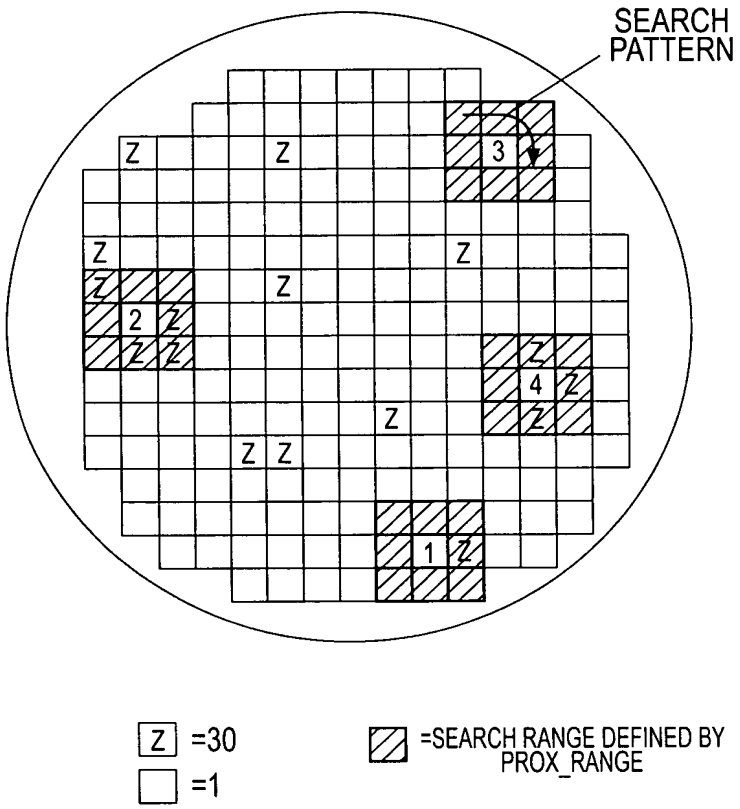

FIG.18

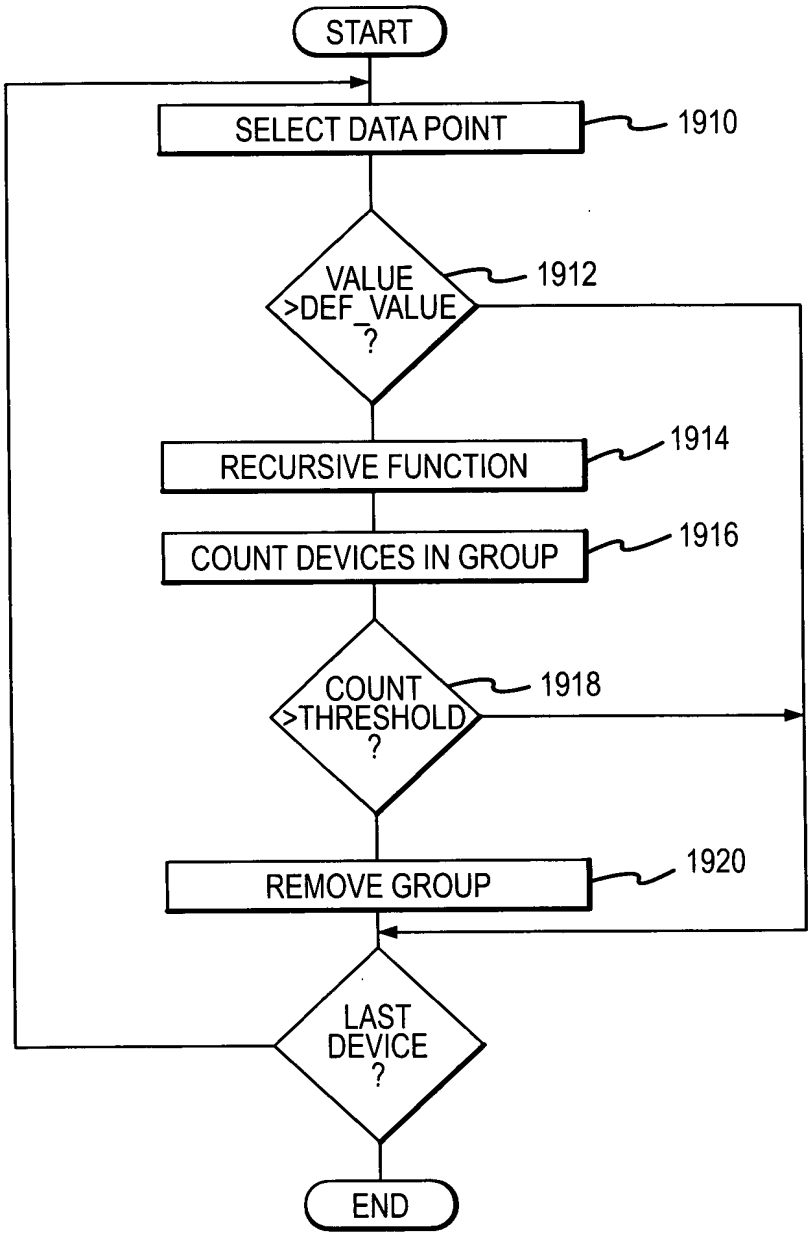
START
SELECT DATA POINT
1910
VALUE >DEF_VALUE ?
1912
RECURSIVE FUNCTION
1914
COUNT DEVICES IN GROUP
1916
COUNT >THRESHOLD ?
1918
REMOVE GROUP
1920
LAST DEVICE ?
END

FIG.19

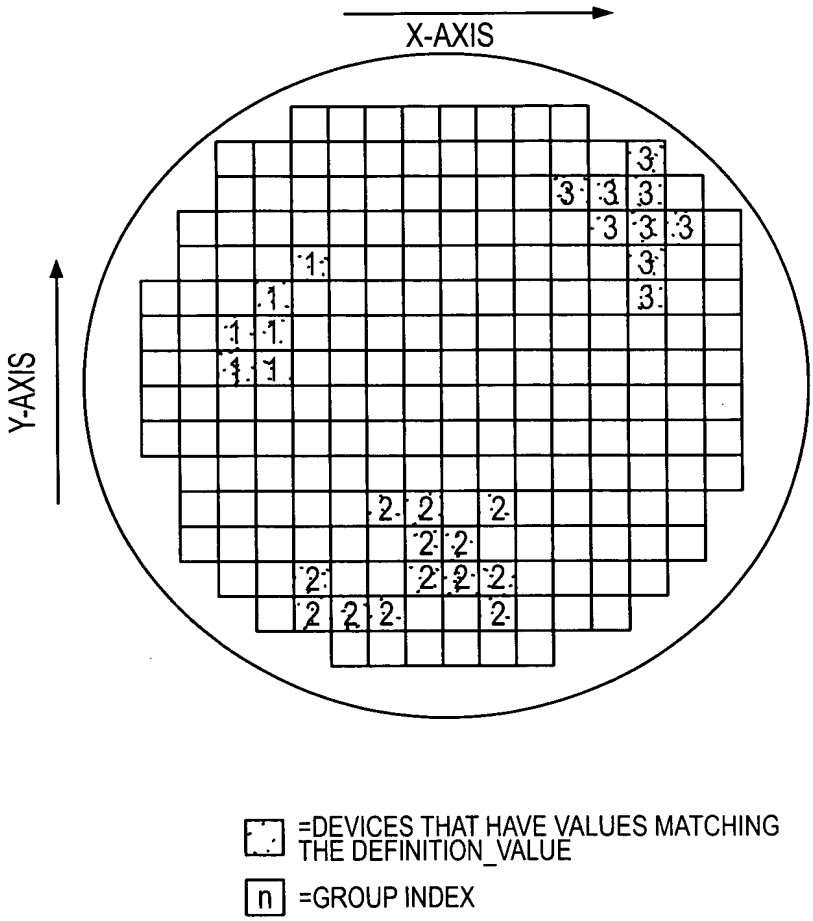
X-AXIS
Y-AXIS
=DEVICES THAT HAVE VALUES MATCHING THE DEFINITION_VALUE
n =GROUP INDEX

FIG.20

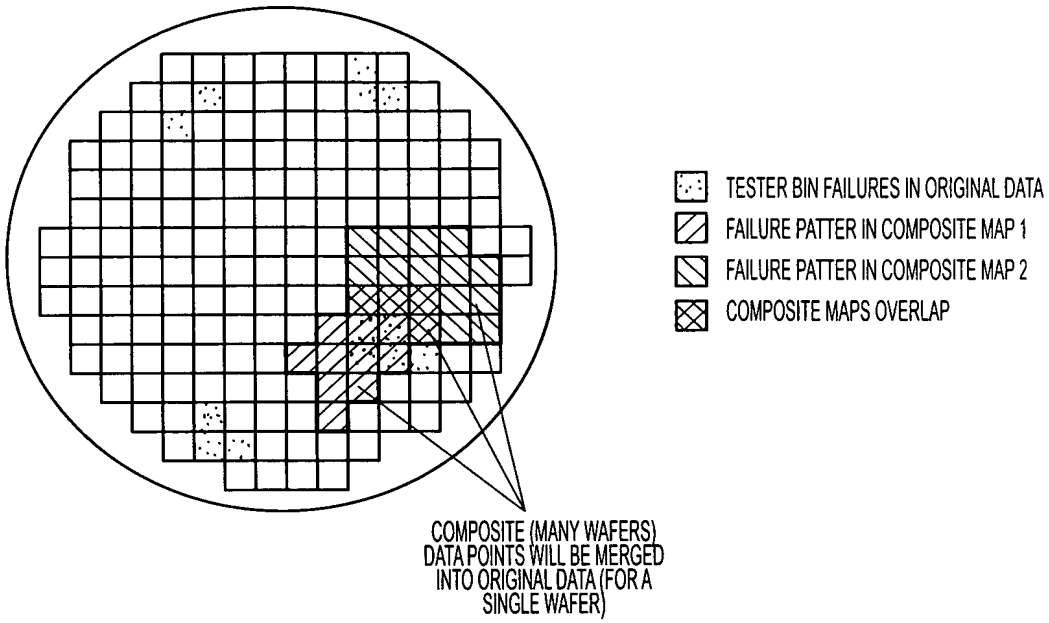
TESTER BIN FAILURES IN ORIGINAL DATA
FAILURE PATTER IN COMPOSITE MAP 1
FAILURE PATTER IN COMPOSITE MAP 2
COMPOSITE MAPS OVERLAP
COMPOSITE (MANY WAFERS) DATA POINTS WILL BE MERGED INTO ORIGINAL DATA (FOR A SINGLE WAFER)

FIG.21

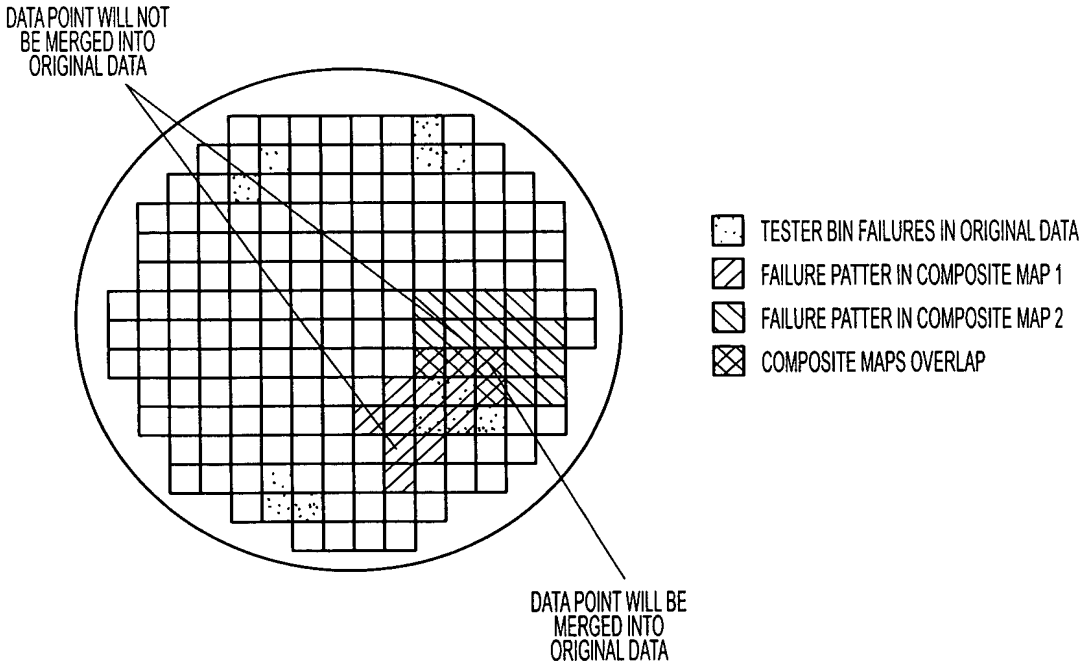
DATA POINT WILL NOT BE MERGED INTO ORIGINAL DATA
TESTER BIN FAILURES IN ORIGINAL DATA
FAILURE PATTER IN COMPOSITE MAP 1
FAILURE PATTER IN COMPOSITE MAP 2
COMPOSITE MAPS OVERLAP
DATA POINT WILL BE MERGED INTO ORIGINAL DATA

FIG.22

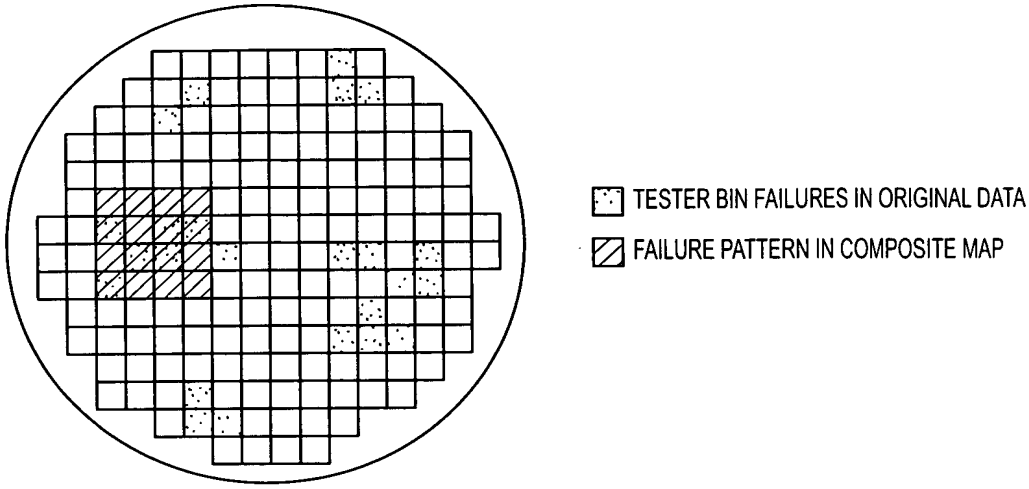
TESTER BIN FAILURES IN ORIGINAL DATA
FAILURE PATTERN IN COMPOSITE MAP

FIG.23

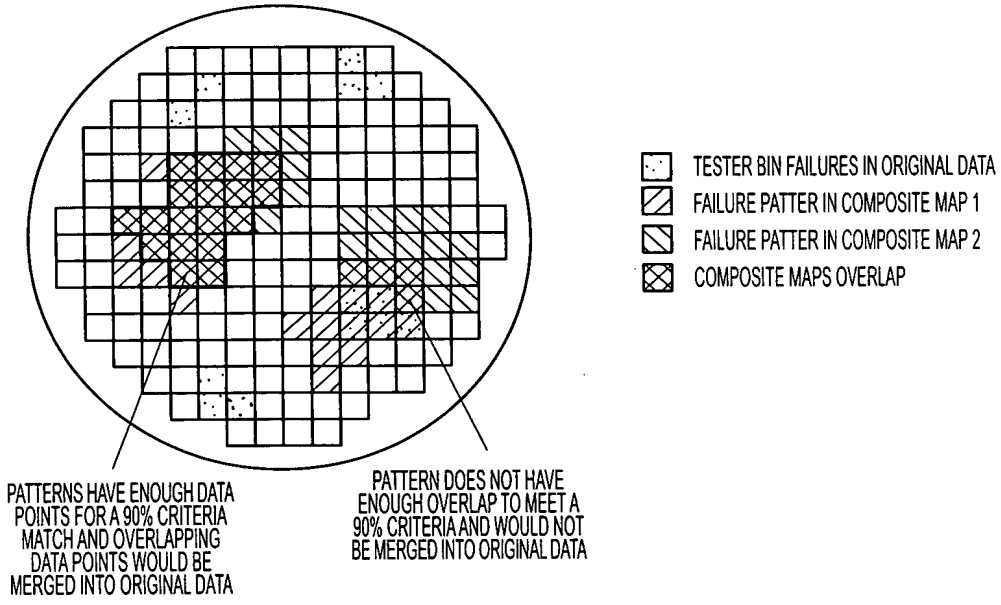
TESTER BIN FAILURES IN ORIGINAL DATA
FAILURE PATTER IN COMPOSITE MAP 1
FAILURE PATTER IN COMPOSITE MAP 2
COMPOSITE MAPS OVERLAP
PATTERNS HAVE ENOUGH DATA POINTS FOR A 90% CRITERIA MATCH AND OVERLAPPING DATA POINTS WOULD BE MERGED INTO ORIGINAL DATA
PATTERN DOES NOT HAVE ENOUGH OVERLAP TO MEET A 90% CRITERIA AND WOULD NOT BE MERGED INTO ORIGINAL DATA

FIG.24

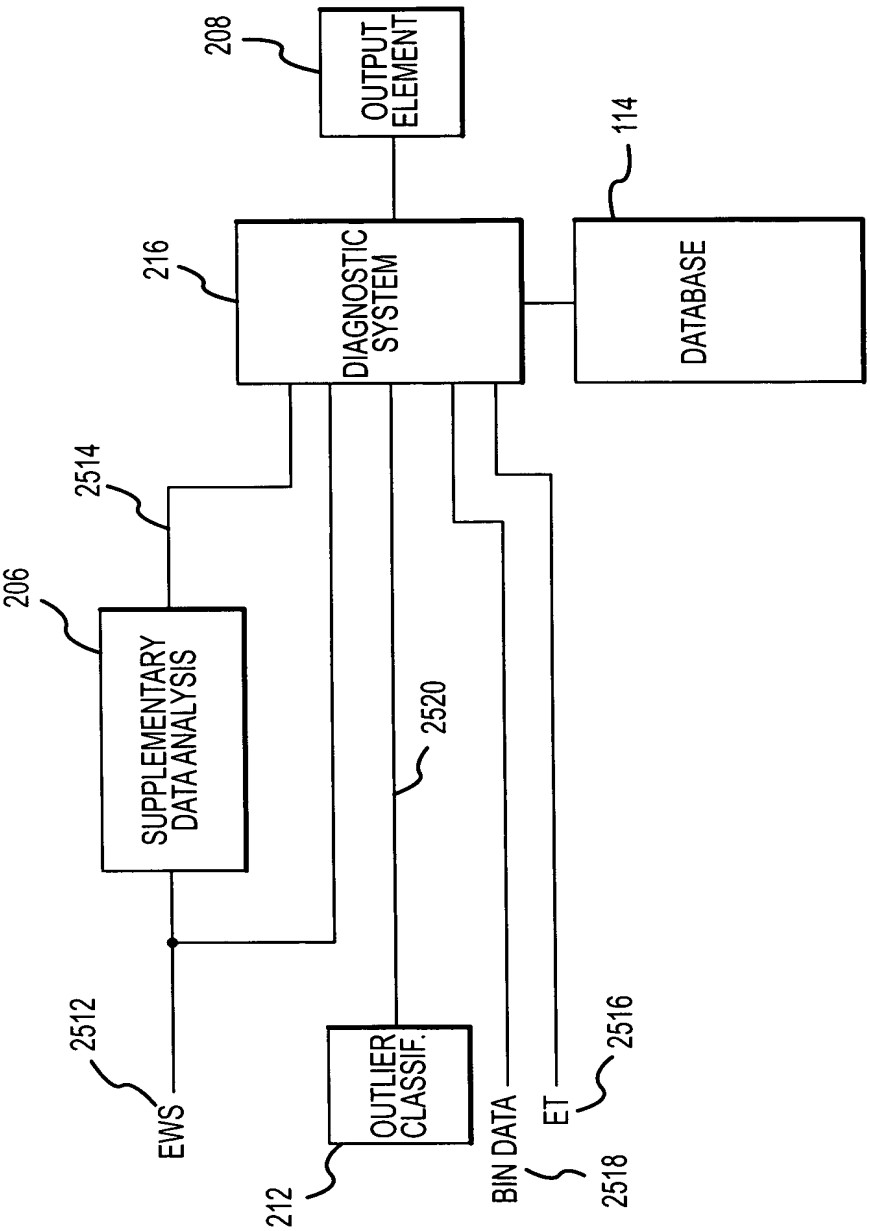
208
OUTPUT ELEMENT
114
216
DIAGNOSTIC SYSTEM
DATABASE
2514
206
SUPPLEMENTARY DATA ANALYSIS
2520
2512
EWS
OUTLIER CLASSIF.
212
BIN DATA
2518
ET
2516

FIG.25

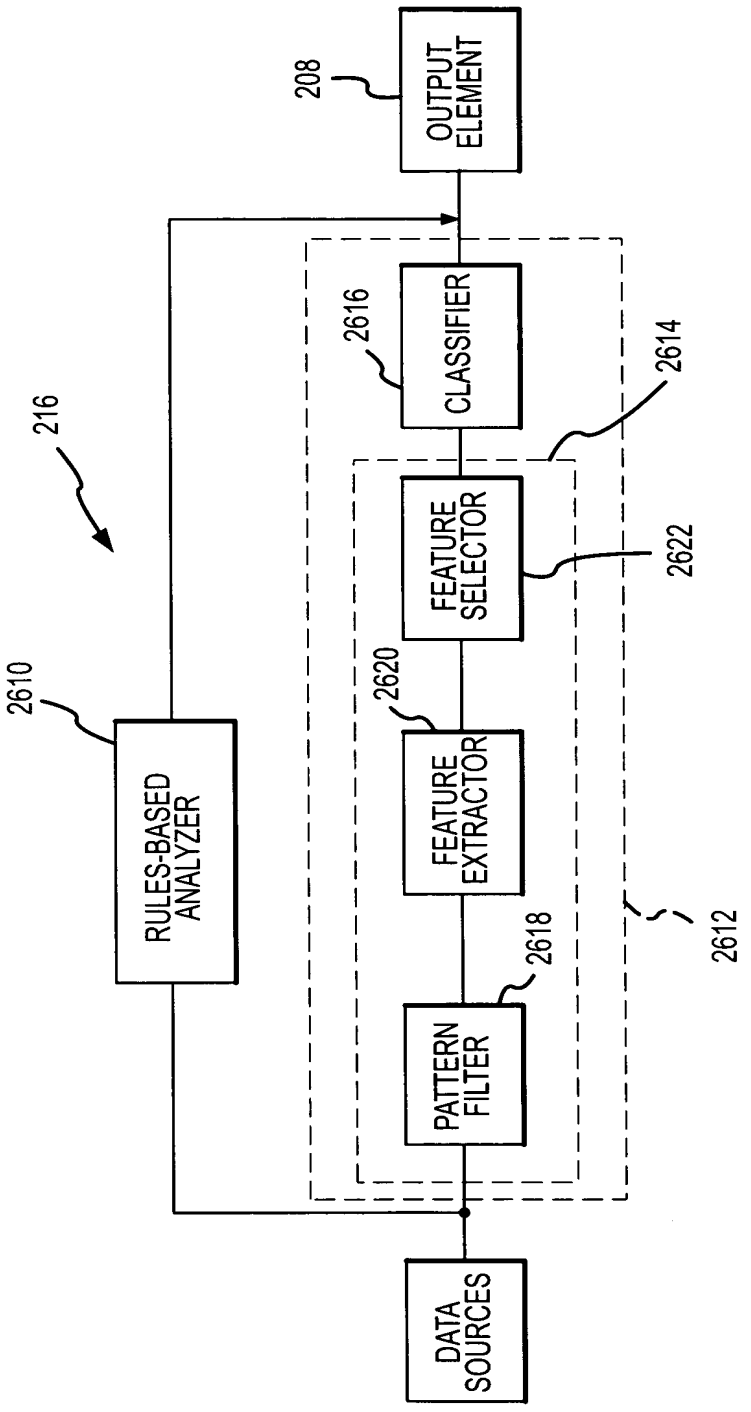
208
OUTPUT ELEMENT
2616
CLASSIFIER
2614
216
FEATURE SELECTOR
2622
2610
2620
FEATURE EXTRACTOR
RULES-BASED ANALYZER
2618
2612
PATTERN FILTER
DATA SOURCES

FIG.26

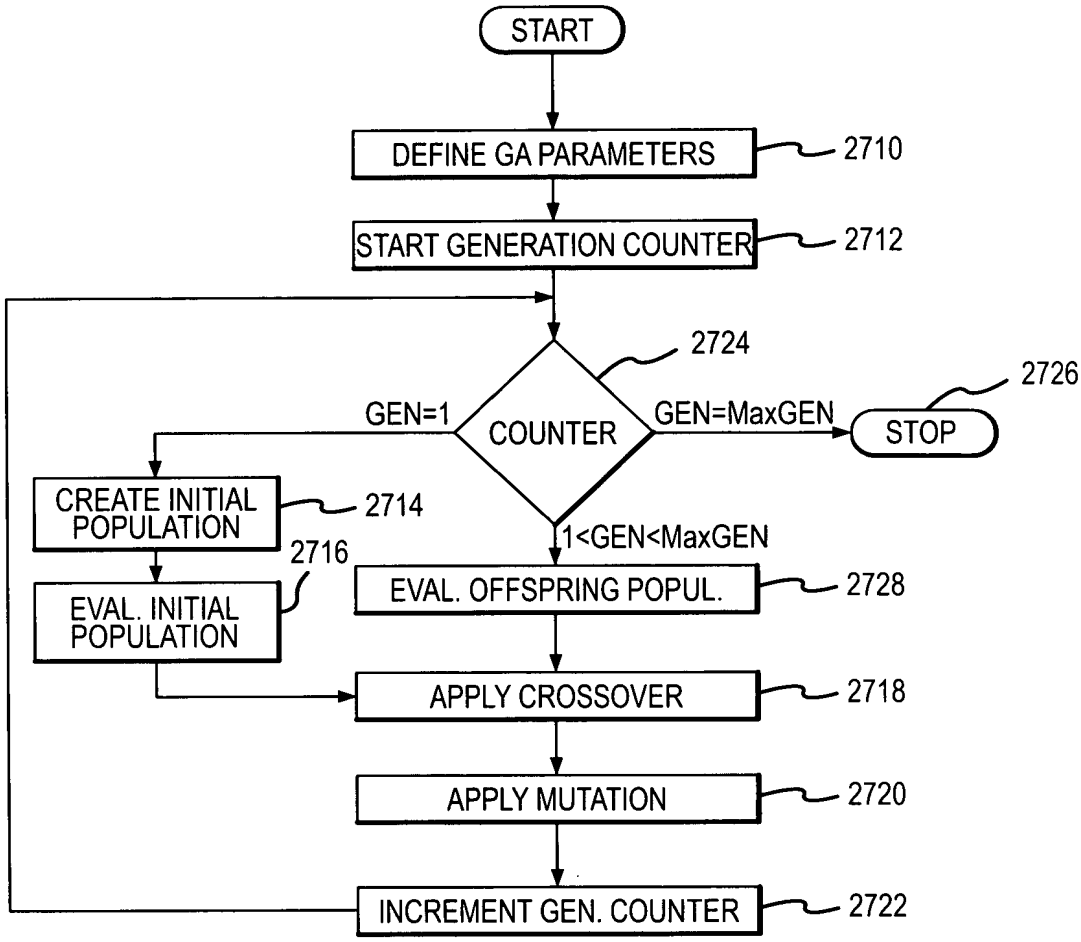
START
DEFINE GA PARAMETERS
2710
START GENERATION COUNTER
2712
2724
COUNTER
GEN=1
GEN=MaxGEN
2726
STOP
CREATE INITIAL POPULATION
2714
2716
EVAL. INITIAL POPULATION
1<GEN<MaxGEN
EVAL. OFFSPRING POPUL.
2728
APPLY CROSSOVER
2718
APPLY MUTATION
2720
INCREMENT GEN. COUNTER
2722

FIG.27

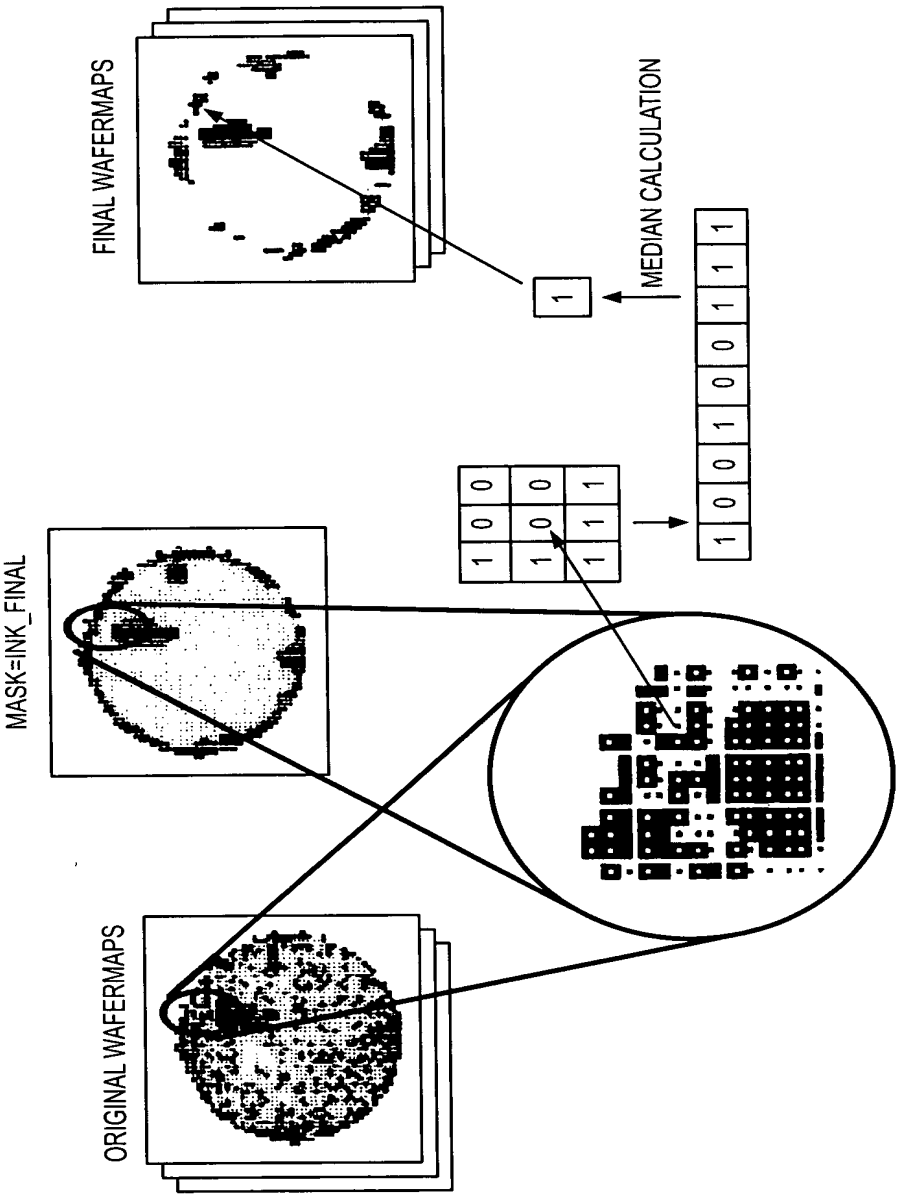
FINAL WAFERMAPS
MEDIAN CALCULATION
1
1 0 0
1 0 0
1 1 1
1 0 0 1 0 0 1 1 1
MASK=INK_FINAL
ORIGINAL WAFERMAPS

FIG.28

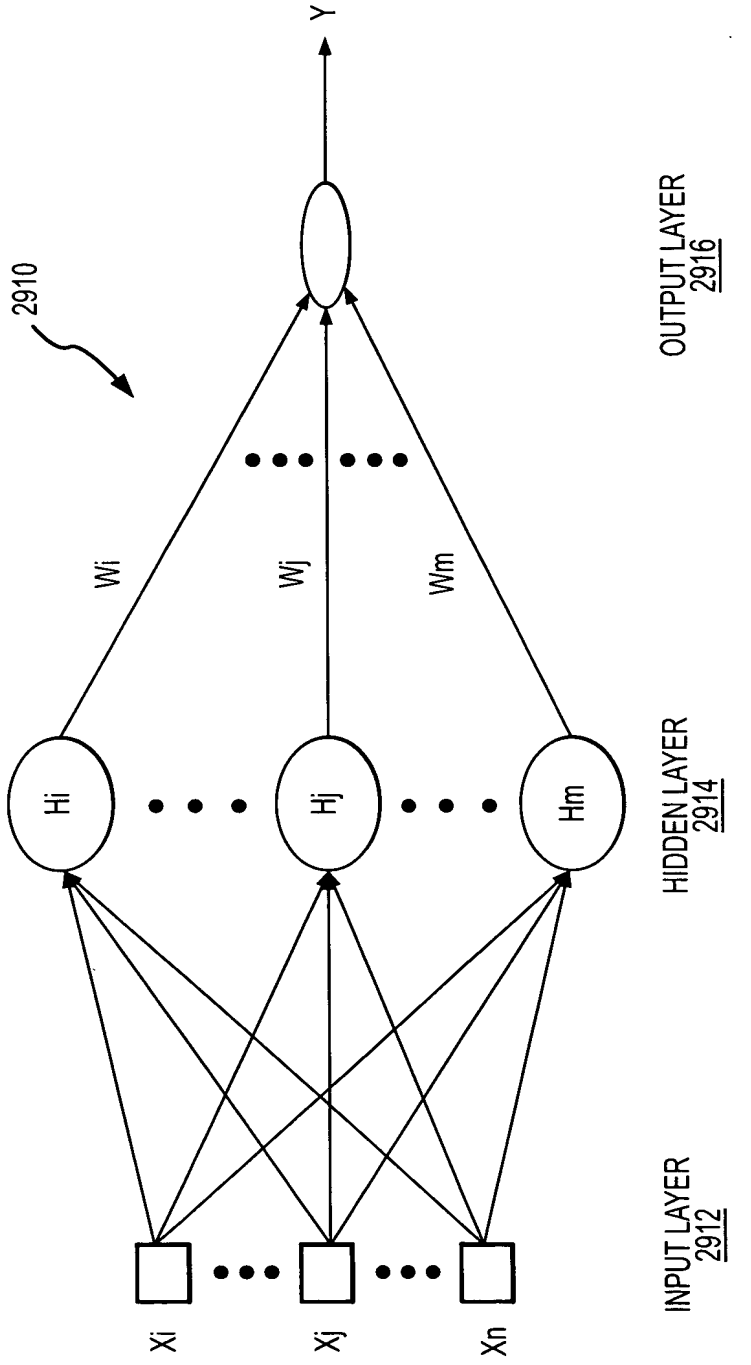
Y
2910
OUTPUT LAYER
2916
Wi
Wj
Wm
Hi
Hj
Hm
HIDDEN LAYER
2914
INPUT LAYER
2912
Xi
Xj
Xn

FIG.29